The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A microfluidic structure comprising:

a plurality of diaphragm valves that control fluid flow along each of a plurality of fluidic channels, said fluidic channels each comprising a discontinuity and wherein the microfluidic structure comprises an elastomer membrane sandwiched between a pneumatic layer and a fluidic layer, wherein:

the pneumatic layer comprises a first surface including ~~a~~ at least one pneumatic channel facing the membrane and valve areas aligned with said fluidic channel discontinuities;

the fluidic layer comprises a second surface including ~~a~~ the plurality of fluidic channels facing the membrane;

the elastomeric membrane normally prevents fluid flow across the fluidic channel discontinuities; and

~~an elastomer membrane located between the first and second surfaces such that~~ the application of ~~a pressure or~~ a vacuum to the at least one pneumatic channel causes the membrane to deflect to ~~modulate~~ allow a flow of a fluid ~~in~~ across the fluidic channel discontinuities, thereby forming the plurality of diaphragm valves.

2. (Currently amended) The microfluidic structure of claim 1, wherein the first and second ~~surfaces~~ layers are glass~~, plastic, polymer~~.

3. (Original) The microfluidic structure of claim 1, wherein the membrane is gas permeable.

4. (Currently amended) The microfluidic structure of claim 1, further comprising additional surfaces and membranes in fluidic communication with the microfluidic structure through a plurality of vias.

5. (Original) The microfluidic structure of claim 4, wherein the additional surfaces have additional channels to provide paths for fluid flow.

6. (Currently amended) The microfluidic structure of claim 1, wherein the ~~second surface~~ fluidic layer includes a plurality of vias operable to provide paths for fluid flow through the fluidic layer.

7. (Currently amended) The microfluidic structure of claim 1 configured as part of ~~a~~ one or more pumps, ~~the comprising a plurality of valves implemented using the elastomer membrane~~ wherein each pump comprises three diaphragm valves in series and comprising an input valve, a displacement valve, and an outlet valve, wherein each diaphragm valve is actuated by a different pneumatic channel and the three diaphragm valves are independently activated in a sequence designed to move fluid through the pump.

8. (Currently amended) The microfluidic structure of claim 7, wherein one or more of the pumps is used to form a multi-directional fluidic router, said router comprising one central displacement valve in fluid communication with one or more input valves and one or more outlet valves.

9. (Currently amended) The microfluidic structure of claim 7 ~~claim 1 placed in a loop and~~ configured as ~~part of~~ a mixer, wherein the input valves and output valves of the pump are each connected to admission channels to form a mixer wherein mixing is accomplished by actuating the three diaphragms in a sequence to pump the fluid in a loop or back and forth.

10. (Canceled)

11. (Currently amended) The microfluidic structure of claim 1 wherein the pneumatic layer comprises a pneumatic channel comprising a displacement chamber wherein deflection of the membrane forms a fluid reservoir in the fluidic channel ~~configured as part of a reservoir~~.

12. (Original) The microfluidic structure of claim 11, wherein mixing is accomplished by moving a fluid between two reservoirs.

13. (Currently amended) The microfluidic structure of claim 11, wherein ~~multiple~~ reservoirs in each of a plurality of the fluidic channels are connected by a fluidic bus.

14. (Original) The microfluidic structure of claim 11, wherein the reservoir has one or more inputs and is operable as a reactor.

15. (Canceled)

16. (Withdrawn) A microfluidic structure comprising: a first surface including a pneumatic channel; a second surface including a plurality of vias; a third surface including a fluidic channel; and an elastomer membrane located between the first and second surfaces such that the application of a pressure or a vacuum to the pneumatic channel causes the membrane to deflect to modulate a flow of a fluid in the fluidic channel.

17. (Withdrawn) The microfluidic structure of claim 16, wherein the first, second, and third surfaces are glass, plastic, or polymer.

18. (Withdrawn) A microfluidic structure comprising: means for allowing flow of a fluid on a first layer; means for modulating the flow of the fluid on the first layer using the application of a pneumatic pressure or vacuum to control an area of a membrane coupled to the first layer.

19. (Withdrawn) A microfluidic device, comprising: a chemically compatible layer, the chemically compatible layer having a plurality of channels, the channels operable to provide paths for fluid flow; and a membrane layer coupled to the chemically compatible layer, wherein applying pneumatic pressure to regions of the membrane layer is operable to actuate a plurality of pneumatically switchable valves, wherein the pneumatically switchable valves are operable to control fluid flow on the microfluidic device.

20. (Withdrawn) The microfluidic device of claim 19, wherein the chemically compatible layer is a glass, plastic, or polymer layer.

21. (Withdrawn) The microfluidic device of claim 20, further comprising a pneumatic layer, the pneumatic layer having a plurality of etched channels, the etched channels operable to distribute the pneumatic pressure to regions of the membrane layer.

22. (Withdrawn) The microfluidic device of claim 21, wherein the membrane layer is sandwiched between the glass layer and the pneumatic layer.

23. (Withdrawn) The microfluidic device of claim 19, wherein three pneumatically switchable valves in series is operable to form a pump.

24. (Withdrawn) The microfluidic device of claim 23, wherein the three valves include an input valve, a diaphragm valve, and an output valve.

25. (Withdrawn) The microfluidic device of claim 19, wherein four pneumatically switchable valves are operable to form a router.

26. (Withdrawn) The microfluidic device of claim 19, wherein pneumatically switchable valves are operable to form a mixer, wherein a fluid analyte is moved back an forth between chambers to allow mixing.

27. (Withdrawn) The microfluidic device of claim 22, wherein the pneumatic layer is glass.

28. (Withdrawn) The microfluidic device of claim 20, wherein the valves are closed when no pneumatic pressure is applied.

29. (Withdrawn) The microfluidic device of claim 20, wherein a single port supplying pneumatic pressure is operable to open multiple valves.

30. (Canceled)

31. (Canceled)

32. (Canceled)

33. (Canceled)

34. (Canceled)

35. (Withdrawn) The microfluidic device of claim 19, wherein three valves are placed in a loop to form a mixer.

36. (Withdrawn) The microfluidic device of claim 19, wherein valves held in the open position are operable to function as reservoirs.

37. (Withdrawn) The microfluidic device of claim 19, wherein mixing is accomplished by moving a fluid between two reservoirs.

38. (Withdrawn)The microfluidic device of claim 19, wherein multiple reservoirs are connected by a fluidic bus to form a bus valve.

39. (Withdrawn) The microfluidic device of claim 36, wherein reservoirs with one or more inputs is operable as a reactor.

40. (Withdrawn) A method for controlling fluid flow on a microfluidic device, the method comprising: opening an input valve and closing an output valve by varying pneumatic pressure to one or more regions of a membrane layer coupled to a glass layer, the glass layer having a plurality of etched channels, the etched channels operable to provide paths for fluid flow; opening a diaphragm valve and closing the input valve by varying pneumatic pressure; and opening the output valve and closing the diaphragm valve, wherein closing the diaphragm valve pumps analyte fluid through the open output valve.

41. (Withdrawn) The method of claim 40, wherein varying pneumatic pressure includes applying pressure or applying vacuum pressure.

42. (Withdrawn) The method of claim 40, wherein the microfluidic device comprises a pneumatic layer, the pneumatic layer having a plurality of etched channels, the etched channels operable to distribute the pneumatic pressure to regions of the membrane layer.

43. (Withdrawn) A microfluidic device, comprising: means for opening an input valve and closing an output valve by varying pneumatic pressure to one or more regions of a membrane layer coupled to a glass layer, the glass layer having a plurality of etched channels, the etched channels operable to provide paths for fluid flow; means for opening a diaphragm valve and closing the input valve by varying pneumatic pressure; and means for opening the output valve and closing the diaphragm valve, wherein closing the diaphragm valve pumps analyte fluid through the open output valve.

44. (Withdrawn) The microfluidic device of claim 43, wherein varying pneumatic pressure includes applying pressure or applying vacuum pressure.

45. (New) The microfluidic structure of claim 1 wherein one pneumatic channel actuates a plurality of diaphragm valves that control fluid flow in a plurality of different fluidic channels.

46. (New) The microfluidic structure of claim 1 wherein different pneumatic channels each actuate a diaphragm valve that controls fluid flow in different fluidic channels.

47. (New) The microfluidic structure of claim 1, wherein the first and second layers are plastic.

48. (New) The microfluidic structure of claim 1 wherein the membrane is PDMS.

49. (New) The microfluidic structure of claim 1 wherein the pneumatic layer further comprises one or more pneumatic ports to supply vacuum to the pneumatic channel.

SUMMARY OF CLAIMS

Claims 1-9, 11-14 and 45-49 are pending. Claims 10, 15 and 30-34 are canceled. Claims 16-44 are withdrawn. Claims 1-2, 4, 6-9, 11 and 13 are currently amended. Claims 45-49 are new. Reconsideration is respectfully requested in light of the following remarks.

No new matter is entered by the amendments.

Support for the amended and new claims can be found, for example, as listed below:

Amended/New Claim #	**Support**
1	Specification at page 8, lines 12-13 and lines 30-32; page 9, lines 31-33; page 11, lines 9-12; Figures 1A-E, 2A and B
2	Specification at page 8, lines 14-18
6	Specification at page 8, lines 30-32
7	Specification at page 11, lines 1-16; Figures 2A and B
8	Specification at page 12, lines 7-17; Figure 3
9	Specification at page 12, line 29 to page 13, line 6; Figure 4
11	Specification at page 9, lines 31-33; Figure 1D
13	Specification at page 14, lines 20-22; Figure 6
45	Specification at page 11, lines 1-3
46	Specification at page 11, lines 5-7
47	Original claim 2
48	Specification at page 8, lines 21-24
49	Specification at page 9, lines 27-29